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IS 14667 (1999): Conveyor Chains and Slats Used in Sugar Industry [FAD 2: Sugar Industry]

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IS 14667 : 1999
(Amalgamating IS 8465 : 1990,
IS 8466 : 1990, IS 9054 : 1983
and IS 9069 : 1979)

भारतीय मानक

चीनी उद्योग में प्रयुक्त वाहक कड़ियां और पट्टियां — विशिष्टि

Indian Standard

CONVEYOR CHAINS AND SLATS USED IN SUGAR INDUSTRY — SPECIFICATION

ICS 53.040.20; 76.180

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1999 **Price Group 6**

AMENDMENT NO. 1 MAY 2002
TO
IS 14667 : 1999 CONVEYOR CHAINS AND SLATS USED IN SUGAR INDUSTRY — SPECIFICATION

(*Page* 3, *clause* 5.1, *lines* 1 *to* 3) — Substitute the following for the existing:

5.1 The finished chain shall be accurate within $^{+0.25}_{-0.0}$ percent of the nominal chain length when measured under the following conditions:

(FAD 2)

Reprography Unit, BIS, New Delhi, India

Sugar Industry Sectional Committee, FAD 2

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Sugar Industry Sectional Committee, had been approved by the Food and Agriculture Division Council.

The chains and slats are important components used in sugar industry to carry material at various stages.

This Indian Standard, an amalgamated form of IS 8465, IS 8466, IS 9054, IS 9069 and a document on feeder table chain, describes the requirements at one place.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

CONVEYOR CHAINS AND SLATS USED IN SUGAR INDUSTRY — SPECIFICATION

1 SCOPE

This standard specifies materials, dimensions and other requirements for various chains and slats used in sugar industry.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
549 : 1974	Split pins (*second revision*)
1570 (Part 4) : 1988	Schedules for wrought steel: Part 4 Alloy steels (alloy constructional and spring steels) with specified mechanical composition and mechanical properties (*first revision*)
1875 : 1978	Specification for carbon steel billets, blooms, slabs and bars for forgings (*fourth revision*)
2108 : 1977	Blackheart malleable iron casting (*first revision*)
4367 : 1991	Alloy steel forgings for general industrial use (*first revision*)
2062 : 1992	Steel for general structural purposes (*fourth revision*)
2500 (Part 1) : 1992	Sampling inspection procedures: Part 1 Attribute sampling plans indexed by acceptable quality level (AQL) for lot by lot inspection (*second revision*)
5517 : 1993	Steel for hardening and tempering (*second revision*)

3 MATERIAL

3.1 The material for side links, pin, bush and roller for cane carrier, bagasse carrier and feeder table chains shall be as given below.

3.1.1 *Side Links*

Steel conforming to Grade 55 C8 of IS 1875 shall be used.

3.1.2 *Pin and Bush*

Steel conforming to Grade 16Ni3Cr2 of IS 1570 (Part 4) shall be used.

3.1.3 *Roller*

Mild steel conforming to IS 2062 shall be used.

3.1.4 *Slats*

Mild steel conforming to Grade Fe 410-s of IS 2062 shall be used.

3.2 Material for side links, pin, bush and roller for apron type inter carrier chain shall be as given below.

3.2.1 *Links*

Blackheart malleable cast iron of IS 2108 and forged steel of IS 4367.

3.2.2 *Pin*

Steel conforming to Grade 55 C8 of IS 1875 and grade 40 C8 of IS 5517.

3.2.3 *Bush*

Steel conforming to Grade 40 C8 of IS 5517.

4 DIMENSIONS

4.1 Chains

4.1.1 The dimensions of various chains along with the breaking and proof loads shall be as given in Tables 1 to 4.

Table 1 Dimensions and Requirements for Apron Type Inter-Carrier Chains

(*Clause* 4.1.1)

All dimensions in millimetres.

Sl No.	Pitch	Pin Dia	Bush Inner Dia	Loads, *Min*		Thickness of Corresponding Slat	Width of Corresponding Slat
				Breaking	Proof		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	mm	mm	mm	kN	kN	mm	mm
i)	80.0 (one hole[1])	$16^{+0}_{-0.05}$	$16.1^{+0.05}_{-0}$	117	39	$5^{+1.0}_{-0.0}$	110 - 115 ± 1.0
ii)	75.4	$16^{+0}_{-0.05}$	$16.1^{+0.05}_{-0}$	117	39	$5^{+1.0}_{-0.0}$	110 - 115 ± 1.0

[1] The hole shall be of 16 mm dia. Split pins shall be of 32 *m/m* length and 4 mm dia (*see* IS 549).

Table 2 Dimensions and Requirements for Cane-Carrier Chains

(*Clause* 4.1.1 and *Fig.* 3)

All dimensions in millimetres.

Pitch	Thickness of Side Links	Pin			Bush		Roller		Split Pin		Side Links				Bolt			Loads in kN, *Min*		Thickness of Corresponding Slat	Width of Pesting Slats mm
		Dia	Length	Dia of Head	Dia	Length	Dia	Length	Dia	Length					Cross Section		Hole Dia	Breaking	Proof		
A	*B*	*C*	*D*	*J*	*K*	*F*	*G*	*H*			*K*	*L*	*M*	*N*	*S*	*T*	*V*				
150	10	23	92	28	30	56	75	35	6.3	45	60	45	30.0	5	150	75	14	300	135	5^{+1}_{-0}	188-183
150	12	25	101	32	33	61	75	35	6.3	45	65	47.5	32.5	3	150	75	14	400	175	6^{+1}_{-0}	188-183
200	16	30	125	38	38	69	90	35	10	50	75	56.0	37.5	3	170	100	14	600	250	6^{+1}_{-0}	188-183

NOTE — The chain manufacturer, sugar machinery manufacturer or actual users shall adopt higher size of side links (higher dimension '*K*') to provide extra margin in breaking load over stated in standard.

Table 3 Dimensions and Requirements for Baggasse Carrier Chains

(*Clause* 4.1.1 and *Fig.* 4)

All dimensions in millimetres.

Pitch	Thickness of Side Links	Pin			Bush		Roller		Split Pin		Attachment Link					Loads in kN, *Min*	
		Dia	Length	Dia of Head	Dia	Length	Dia	Length	Dia	Length						Breaking	Proof
A	*B*	*C*	*D*	*J*	*E*	*F*	*G*	*H*			*K*	*L*	*M*	*N*	*W*		
150	8	23	82	28	30	52	75	35	6.3	45	60	16	60	12	45	200	100
150	10	23	92	28	30	56	75	35	6.3	45	60	16	65	12	45	400	135
150	12	25	101	32	33	61	75	35	6.3	45	65	19	80	16	50	500	175

NOTE — 1kN/mm^2 = 102 kgf/mm^2.

Table 4 Dimensions and Requirements for Feeder Table Chain

(*Clause* 4.1.1 and *Fig.* 5)

All dimensions in millimetres.

Pitch	Side Link		Pin			Bush		Roller		Split Pin		Attachment Link				Loads in kN, *Min*	
	Thickness	Width	Dia	Length	Dia of Head	Dia	Length	Dia	Length	Dia	Length					Breaking	Proof
A	*B*	*K*	*C*	*D*	*J*	*E*	*F*	*G*	*H*			*L*	*M*	R_1	R_2		
150	8	60	23	82	28	30	52	75	35	5.0	45	125	40	62	46	200	67
150	10	60	23	92	28	30	56	75	35	5.0	45	131	40	62	46	300	100
150	12	65	25	101	32	33	61	80	35	5.0	45	145	40	60	44	400	135

4.1.2 A typical design of various chains are given in Fig. 1 to 5.

4.2 Slats

4.2.1 The width, thickness and number of strands of the slats for different milling plant sizes corresponding to different plant capacities shall be as given in Tables 5 and 6.

Table 5 Dimensions of Apron Type Inter-Carrier Slats for Different Plant Capacities/Sizes

(*Clause* 4.2.1)

Sl No.	Capacity of Plant in Tonnes/Day	Milling Plant Size mm	Length of Slats mm	Width of Slat mm	Thickness of Slat mm
(1)	(2)	(3)	(4)	(5)	(6)
i)	1 250 to 2 000	762 φ × 1 525 *L*	1 520	110 ± 1	5^{+1}_{-0}
ii)	2 500 to 3 500	850 φ × 1 700 *L*	1 695	110 ± 1	5^{+1}_{-0}
iii)	4 000 to 5 000	915 φ × 1 830 *L* or 915 φ × 1 980 L	1 825 or 1 975	115 ± 1	5^{+1}_{-0}

φ= dia of roller.
L = length of roller = Width of carrier trough (inside).
Length of slat = width of carrier − 5mm.

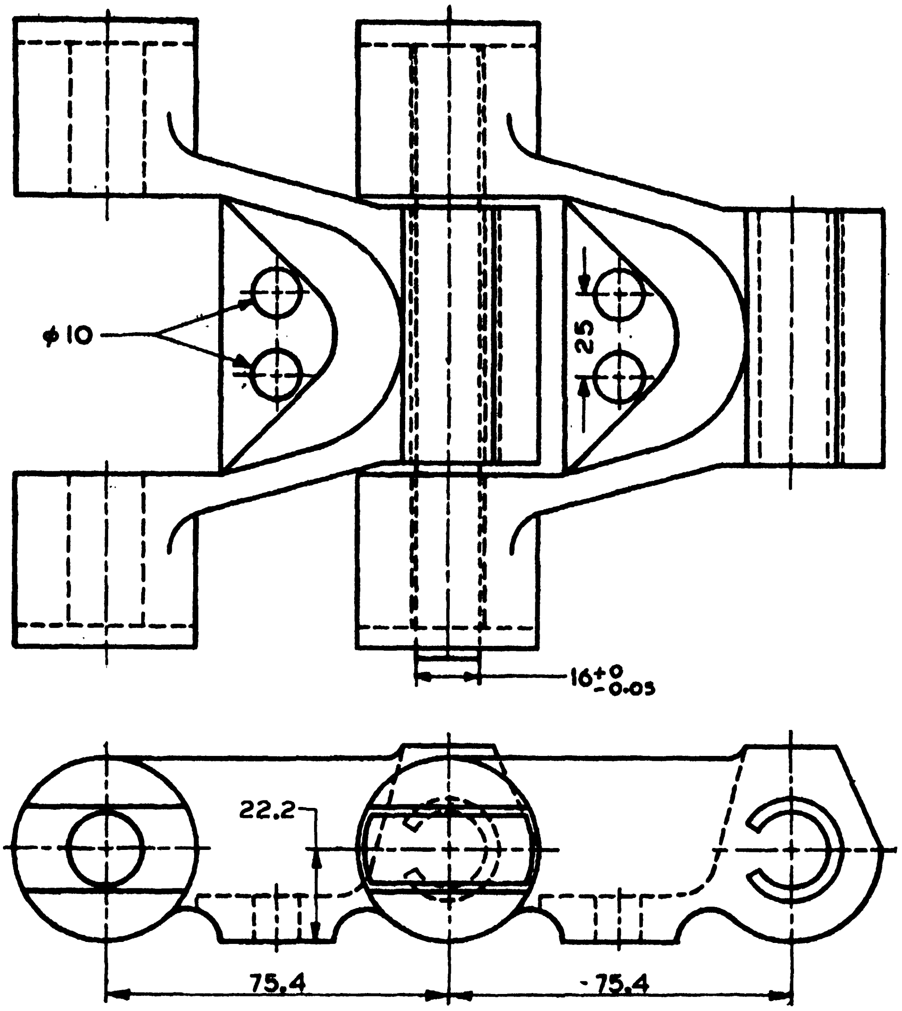


FIG. 1 INTER-CARRIER CHAINS OF 75.4 mm PITCH

Table 6 Dimensions of Slat for Cane-Carrier for Different Plant Capacities/Sizes
(*Clause* 4.2.1)

Sl No. (1)	Capacity of Plant (Tonnes per Day) (2)	(3)	Milling Plant Size (4)	(5)	Width of the Slat, *W* (6)	No. of Strands	Thickness of Slat, *t*
i)	Up to 2 500		762 φ × 1 525 *L*		188 or 183	3	5 ± 0.5
ii)	2 500 to 3 500		850 φ × 1 700 *L*		188 or 183	3	6 ± 0.5
iii)	4 000 to 5 000		915 φ × 1 830 *L* or 915 φ × 1 980 *L*		188 or 183	3	6 ± 0.5

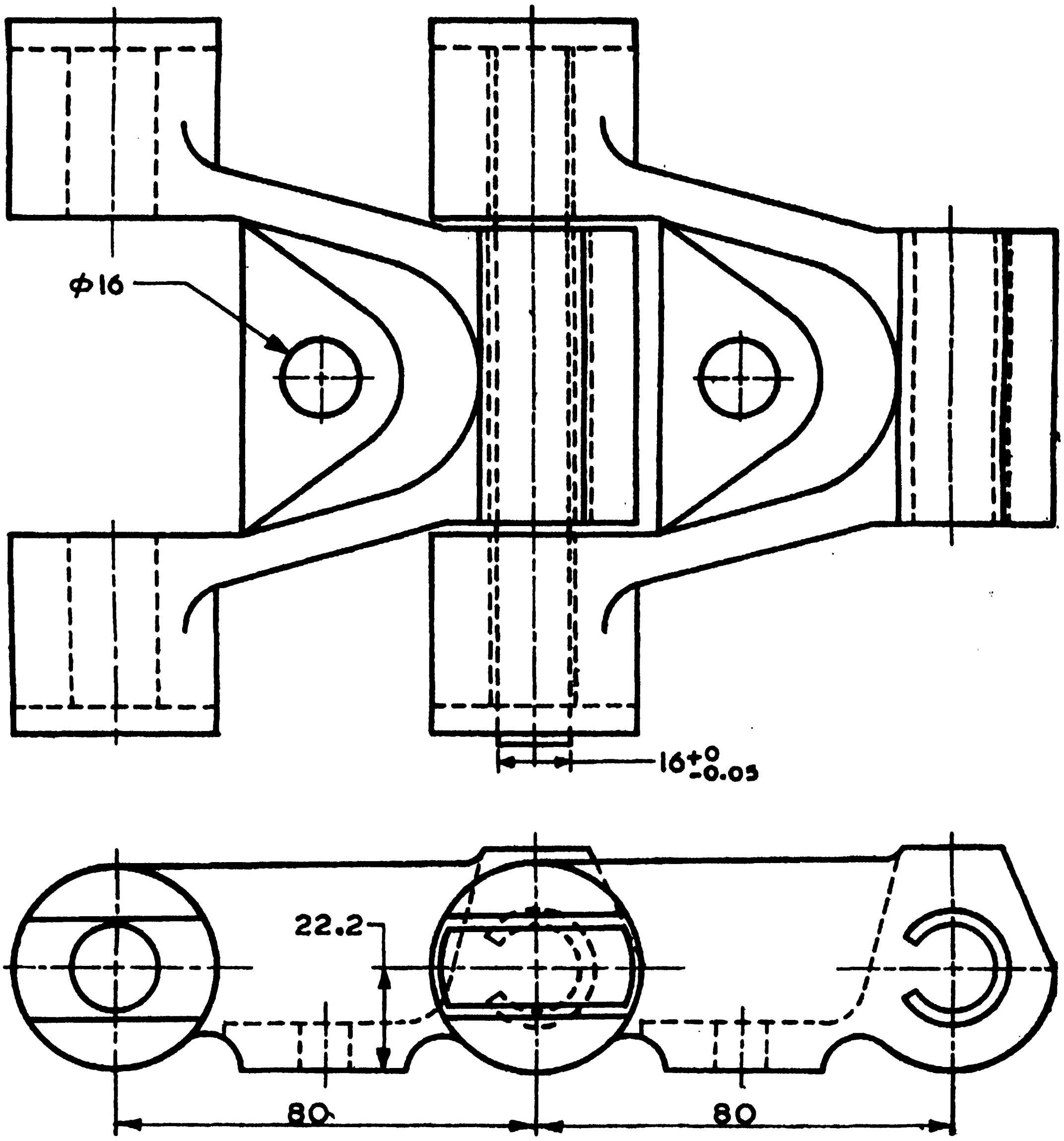
φ = diameter of the roller.
L = length of roller = Width of cane carrier trough (inside).
Length of slat = width of cane-carrier – 5 mm.

4.2.2 Typical designs of slats are given in Fig. 6 to 8.

4.2.3 With respect to Baggasse carrier chain, either rack or split end corrugated plate may be provided. The plate type slat shall be attached to chain through swivel arrangement as shown in Fig. 9.

5 LENGTH ACCURACY

5.1 The finished chain shall be accurate within $^{+0.025}_{-0.0}$ percent of the nominal chain length when measured under the following conditions:



All dimensions in millimetres.

FIG. 2 INTER-CARRIER CHAINS OF 80 mm PITCH

a) *Standard Test Length for Measurement* — The standard length of chain for measurement purposes shall be 3 000 mm;

b) *Support* — The chain, in the unlubricated conditions, shall be supported throughout its entire length; and

c) *Measuring Load* — A measuring load equal to 1/50 of the appropriate breaking load shall be applied (*see* Table 1).

NOTE — The length accuracy of chains which have to work in parallel should be within the above limits but matched by agreement with the manufacturer.

6 HARDNESS

6.1 The hardness of pin shall be 50 ± 5 HRC and the bush shall be 40 ± 5 HRC. The hardness of the roller shall be 30 ± 5 HRC.

7 OTHER REQUIREMENTS

7.1 All chains shall be subjected to suitable heat treatment. Depth of case hardening should be minimum 0.5 mm. The following conditions shall be observed:

a) The heat treatment shall not produce brittleness in chains; and

b) Heating to a temperature within 50°C above the upper critical point of the steel used, forms part of the heat treatment.

7.2 After heat treatment, the standard length of chain shall be subjected to the breaking load prescribed in Table 1.

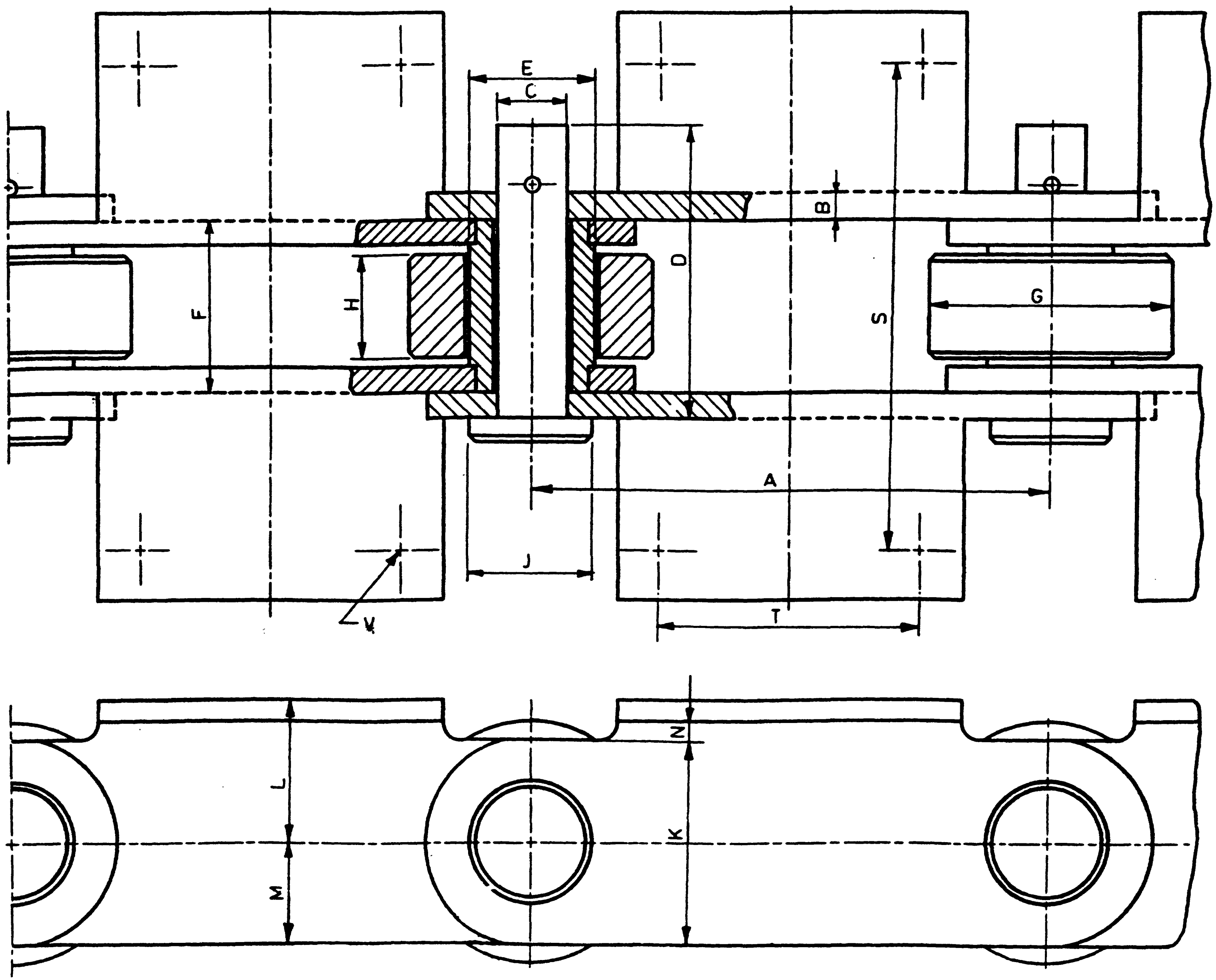


FIG. 3 TYPICAL DESIGN OF CANE-CARRIER CHAINS

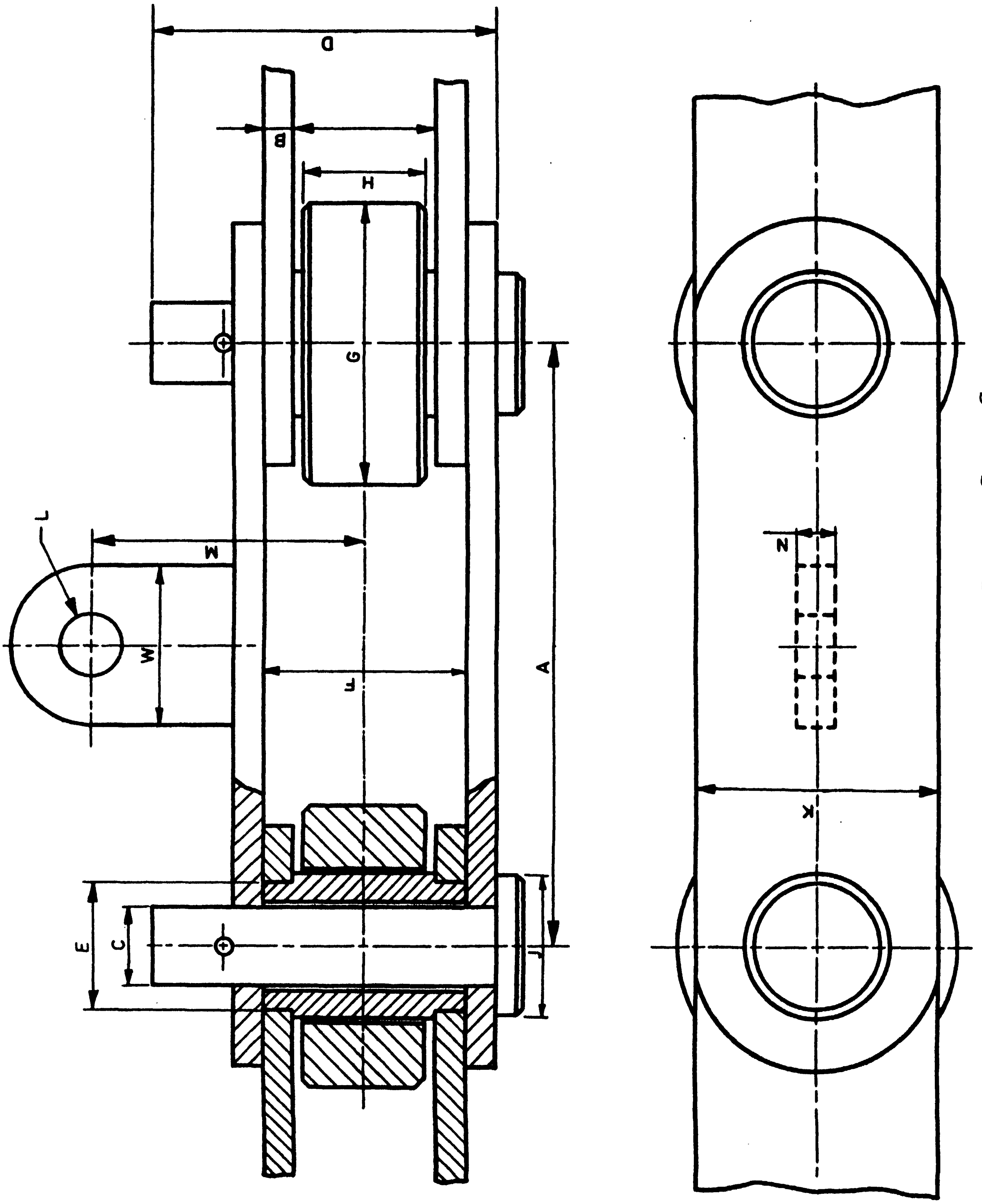
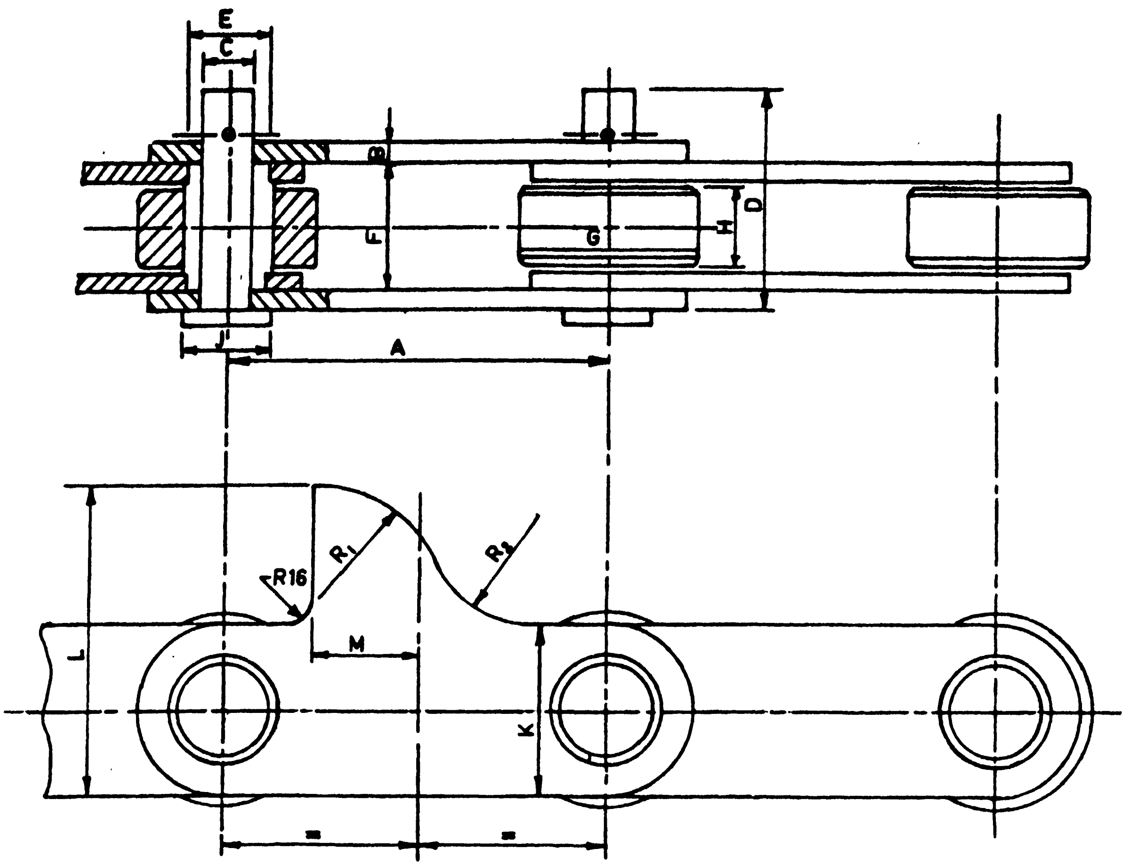


FIG. 4 TYPICAL DESIGN OF BAGGASSE CARRIER CHAIN



NOTE — Attachment link at every 4th pitch.

FIG. 5 DESIGN OF FEEDER TABLE CHAIN

7.3 The standard length of chain shall be tested for proof load as prescribed in Table 1.

7.4 Each roller shall be provided with a groove on the bore for holding grease for lubrication.

7.5 The Baggasse carrier chain shall have attachment at 600 mm pitch. Whole shall be tennoned into the link and a sealing weld run shall be provided.

7.6 Side links shall be formed by hot bending and shall be normalized after bending.

7.7 At the option of the purchaser each pin shall be fitted with brass grease nipple. Holes through each pin and bush shall be provided for the grease to travel to inside and outside surfaces of the bush. Each roller shall be provided with a groove on the base of holding grease.

8 SAMPLING FOR LOT ACCEPTANCE

8.1 Chemical Analysis

Chemical analysis of one split pin, one bush, one roller, one side link from each lot shall be carried out according to the relevant Indian Standard. If the analysis does not conform to the requirements specified, a further chemical analysis each of two pins, bushes, rollers, inner side link and outer side links shall be carried out, each of which shall conform to the specified requirements.

8.2 Mechanical Tests

Mechanical tests for breaking load and proof load shall be made on a specimen (*see* 7.2 and 7.3) from every lot of 300 metres running length. The specimen under test is required to conform to the requirements given in Tables 1 to 4.

NOTE — The term lot applies to all chains of the same pitch and breaking load, heat treated under identical conditions. Each lot shall have running length of not more than 300 m.

9 WORKMANSHIP AND FINISH

9.1 The chain shall be free from pits, burrs and other defects which are detrimental in their use.

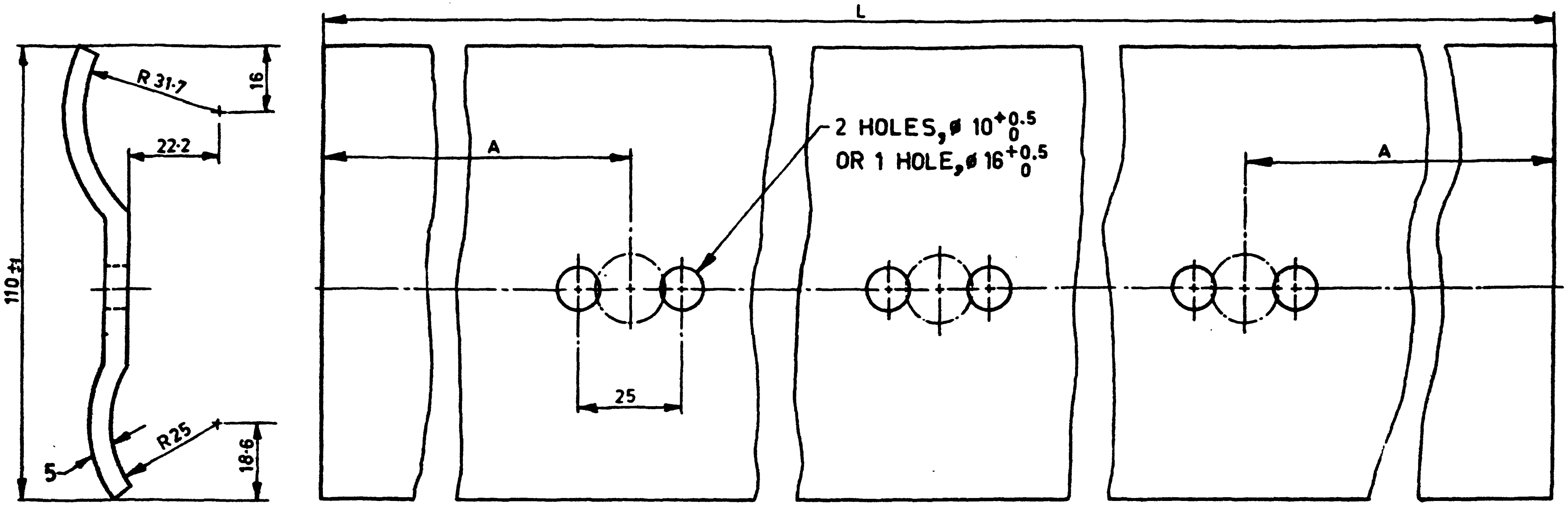
9.2 Protective coating shall be provided on the surface of the chains.

9.3 The pins and bushes shall have ground finish after heat treatment.

10 DESIGNATION

10.1 The chain shall be designated by the following:

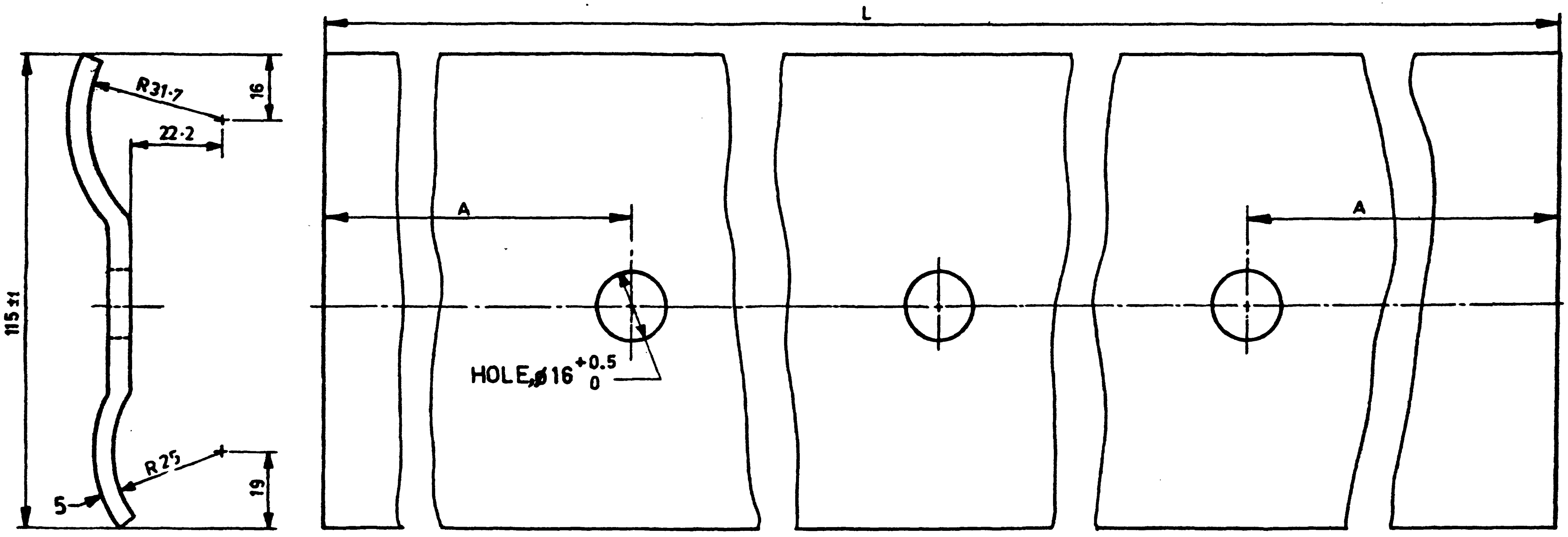
a) Commonly used name,
b) Pitch of the chain,
c) Breaking load, and
d) IS number.



Length of Slat (*L*)	1 520	1 795	2 095
Size '*A*'	200	225	250

All dimensions in millimetres.

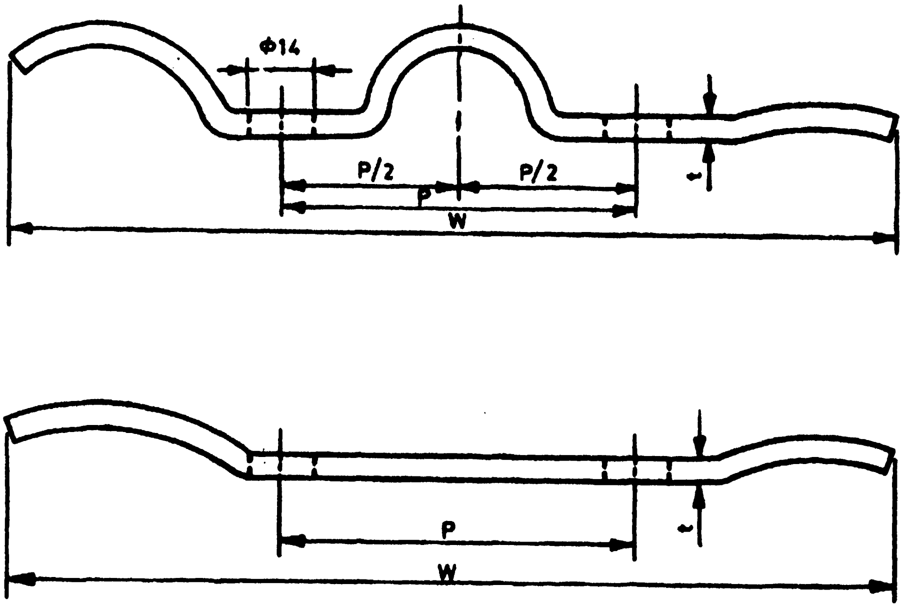
FIG. 6 INTER-CARRIER SLAT FOR 75.4 mm PITCH CHAIN HAVING 3 STRANDS



Length of Slat (*L*)	1 520	1 795	2 095
Size '*A*'	200	225	250

All dimensions in millimetres.

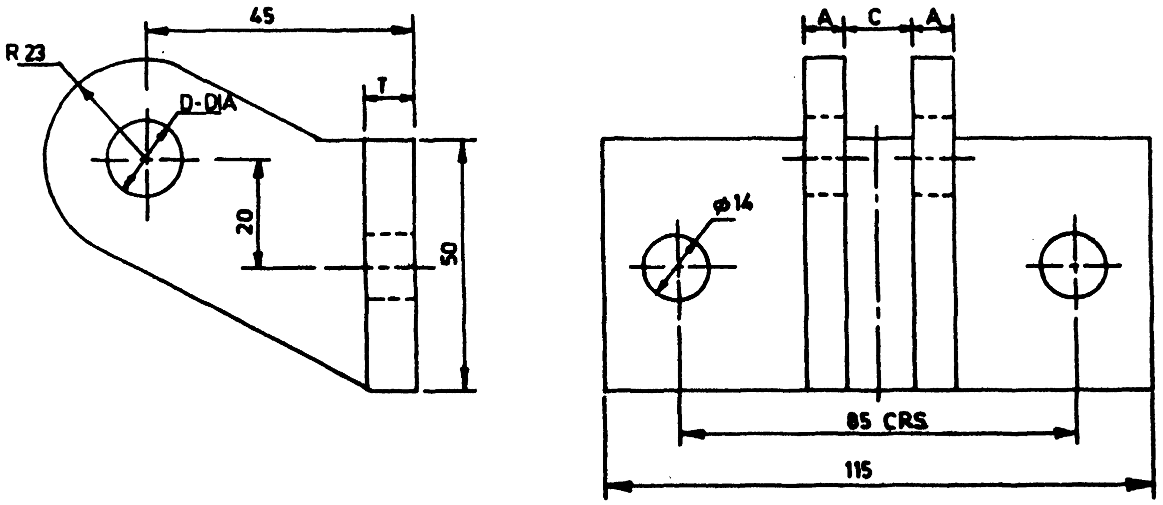
FIG. 7 INTER-CARRIER SLAT FOR 80 mm PITCH CHAIN HAVING 3 STRANDS



P = 60 mm (for hexagonal head bolts)
75 mm (for *T* bolt)

All dimensions in millimetres.

FIG. 8 SLATS FOR CANE-CARRIERS



Pitch	*T*	*A*	*C*	*D*	Breaking Load
150	8	12	13	18	200 kN, *Min*
150	10	12	13	18	300 kN, *Min*
150	12	16	17	20	400 kN, *Min*

MATL - M.S.

All dimensions in millimetres.

FIG. 9 ATTACHMENT LINK FOR BAGGASSE CARRIER CHAIN

11 MARKING

11.1 Each chain shall be marked with the following particulars:

a) Indication of the source of manufacture,
b) Code or Batch number,
c) Chain designation, and
d) Slat thickness and length.

11.2 BIS Certification Marking

The product may also be marked with the Standard Mark.

11.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

12 SAMPLING

12.1 Lot

In a consignment, all slats of same size manufactured from the same material under similar conditions of production shall be grouped together to constitute a lot.

12.2 Unless otherwise agreed to between the supplier and the purchaser, the procedure given in IS 2500 (Part 1) shall be followed for sampling inspection.

13 PACKING

The chains shall be packed as agreed to between the purchaser and the supplier.

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This Indian Standard has been developed from Doc: No. FAD 2 (605).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at Simco Printing Press, Delhi